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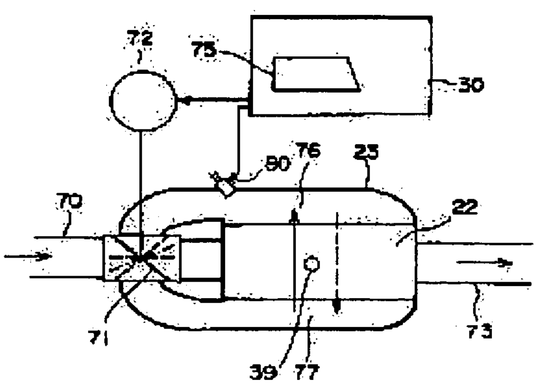
(54) EXHAUST EMISSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an exhaust emission control device for an internal combustion engine capable of effectively performing the reduction of NOX and the oxidation of particulates according to an operation state and not discharging a large quantity of an untreated fuel reducing agent after the reduction of NOX is finished.
SOLUTION: This exhaust emission control device is provided with a filter 22 carrying an NOX absorbent absorbing NOX or releasing the absorbed NOX and an active oxygen releasing agent accelerating the oxidation of the particulates in the exhaust gas and capable of temporarily trapping the particulates in the exhaust gas, an exhaust switching means 71 capable of switching a first flow 76 feeding the exhaust gas from one side of the filter 22 and a second flow 77 feeding the exhaust gas from the other side of the filter 22 in turn and feeding the exhaust gas to a bypass passage 73 detouring the filter 22 during the switching, a reducing agent feeding means 80 feeding the reducing agent to an exhaust passage 76 on the upstream side of the filter, and a control means guiding only part of the exhaust gas to the filter 22 and feeding the flow of the other exhaust gas to the bypass passage 73 to control the feed of the reducing agent for the reducing atmosphere when the particulate oxidizing/removing quantity of the filter 22 is estimated to be decreased.



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CLAIMS

[Claim(s)]
[Claim 1] The NOx absorbent which emits NOx absorbed when the air-fuel ratio of the flowing exhaust gas was Lean, NOx was absorbed and the oxygen density in the flowing exhaust gas fell, The active oxygen emission agent which promotes oxidation of the particle in exhaust gas is supported. The particle in exhaust gas The filter which can temporarily be captured, The 1st flow which passes exhaust gas from the one side of said filter, and the 2nd flow which passes exhaust gas from the other side of said filter can be switched by turns. The exhaust air means for switching passed to the bypass path where exhaust gas bypasses said filter in the middle of a change, The reducing-agent supply means established between the branch point of the flueway switched by turns by this exhaust air means for switching in the flow of exhaust air, and the flueway of said filter upstream, When it is expected that the amount of particle oxidation removal of said filter becomes small While controlling said exhaust air means for switching to lead said a part of exhaust gas to said filter through the flueway of the side which supplies said reducing agent, and to pass other exhaust gas to said bypass path The exhaust emission control device of the internal combustion engine characterized by having the control means which controls said reducing-agent supply means to supply said reducing agent that said filter should be made reducing atmosphere.

[Claim 2] It is the exhaust emission control device of the internal combustion engine according to claim 1 which is the case where the time of moderation of the car with which said internal combustion engine was carried, or fuel oil consumption is smallness when it is expected that the amount of particle oxidation removal of said filter becomes small.
[Claim 3] It is the exhaust emission control device of the internal combustion engine according to claim 2 which controls said reducing-agent supply means to supply said reducing agent that it should make the reducing atmosphere of said filter while controlling said exhaust air means for switching to draw said a part of exhaust gas for said filter compulsorily, and to pass other exhaust gas to said bypass path, when the condition of smallness does not arise [the time of said moderation, or fuel oil consumption] beyond over fixed time amount.

[Claim 4] It is predetermined NOx when the condition of smallness does not arise [the time of said moderation, or fuel oil consumption] beyond over fixed time amount. Exhaust emission control device of the internal combustion engine according to claim 3 which controls said exhaust air means for switching and said reducing-agent supply means compulsorily on the basis of an allowed value.
[Claim 5] The exhaust emission control device of an internal combustion engine given in either of claims 1-4 which carry out control which maintains said exhaust air means for switching so that said a part of exhaust gas may be drawn for said filter over the predetermined time after supply of said reducing agent and other exhaust gas may be passed to said bypass path.
[Claim 6] The NOx absorbent which emits NOx absorbed when the air-fuel ratio of the flowing exhaust gas was Lean, NOx was absorbed and the oxygen density in the flowing exhaust gas fell, The active oxygen emission agent which promotes oxidation of the particle in exhaust gas is supported. The particle in exhaust gas Two or more filters which can temporarily be captured, The 1st flow which passes exhaust gas from the one side of said filter, and the 2nd flow which passes exhaust gas from the other side of said filter can be switched by turns. The exhaust air means for switching passed to the bypass path where exhaust gas bypasses said filter in the middle of a change, When it is expected that a reducing-agent supply means to supply a reducing agent among said two or more filters, and the amount of particle oxidation removal of said filter become small The exhaust emission

control device of the internal combustion engine characterized by having the control means which controls said reducing-agent supply means to supply said reducing agent that said filter should be made reducing atmosphere while controlling said exhaust air means for switching to pass said exhaust gas to said bypass path.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the exhaust emission control device which is applied to an internal combustion engine's exhaust emission control device, especially could be made to carry out change-over passage of exhaust air by turns at the filter of a purge from the exhaust air upstream and the downstream.
[0002]
[Description of the Prior Art] In order to remove particles, such as soot contained in exhaust gas in a Diesel engine, he is trying to reproduce a particulate filter conventionally by carrying out ignition combustion of the particle by which has arranged the particulate filter in an engine flueway, and once carried out uptake of the particle in exhaust gas with this particulate filter, and uptake was carried out on the particulate filter. However, particle by which uptake was carried out on the particulate filter Unless it becomes 600-degree C or more-about elevated temperature, it does not light, but Diesel engine exhaust gas ** is usually quite lower than 600"C to this. Therefore, it is difficult to light the particle by which uptake was carried out to it being also with exhaust gas heat on the particulate filter, and in order to light the particle by which uptake was carried out to it being also with exhaust gas heat on the particulate filter, a particle must enable it to light at low temperature.
[0003] By the way, if a catalyst is conventionally supported on a particulate filter, in order to know that the ignition temperature of a particle can be fallen, therefore to reduce the ignition temperature of a particle conventionally, the various particulate filters which supported the catalyst are well-known.
[0004] For example, Japanese Patent Publication No. The particulate filter which made 7 No. -106290 official report support the mixture of a platinum metal and alkaline earth metal oxide on a particulate filter is indicated. this particulate filter -- about 350-degreeC to 400-degreeC -- comparatively, a particle is lit as it is also at low temperature, and subsequently it is made to burn continuously
[0005]
[Problem(s) to be Solved by the Invention] In a Diesel engine, when the load became high, and the exhaust gas temperature reached 400-degreeC from 350-degreeC, therefore it glanced in the above-mentioned particulate filter and an engine load becomes high, it seems to carry out ignition combustion of the particle with exhaust gas heat. However, even if an exhaust gas temperature reaches 400-degreeC from 350-degreeC in fact, a particle may not light and a particle lights, only some particles will burn, but the problem that a lot of particles burn and remain is produced.
[0006] That is, when there are few amounts of particles contained in exhaust gas, there are few amounts of particles which adhere on a particulate filter and an exhaust gas temperature is set to 400-degreeC from 350-degreeC at this time, the particle on a particulate filter lights and, subsequently is made to burn continuously.
[0007] However, if the amount of particles contained in exhaust gas increases, before the particle which adhered on the particulate filter will burn completely, another particle accumulates on this particle, and as a result, a particle accumulates in the shape of a laminating on a particulate filter. Thus, although some particles which are easy to contact oxygen are made to burn when a particle accumulates in the shape of a laminating on a particulate filter, oxygen is contacted, the particle of the ****** remainder will not burn, but a lot of particles will burn and remain thus. Therefore, when the amount of particles contained in exhaust gas increases, a lot of particles will continue accumulating on a particulate filter.
[0008] the particle these-deposited on the other hand when a lot of particles accumulated on the particulate filter -- gradually -- ignition combustion -- carrying out -- ****** -- ** thus -- burning -- ****** -- it is thought that

it is because the carbon in a particle burns and ** changes to ****** graphite etc. while having deposited probably. In fact, at the low temperature of 350-degreeC to 400-degreeC, when a lot of particles continue accumulating on a particulate filter, in order for the deposited particle not to light but to make the deposited particle light, the elevated temperature more than 600-degreeC is needed. However, in a Diesel engine, an exhaust gas temperature does not turn into an elevated temperature more than 600-degreeC, therefore if a lot of particles continue accumulating on a particulate filter, it will usually become difficult to make the particle deposited with exhaust gas heat light.
[0009] Moreover, if the deposited particle is made to burn, the ash content which is cinder, i.e., an ash, will condense, it will become a big lump, and the pore of a particulate filter will produce blinding with the lump of these ashes. The number of the pores which carried out blinding increases gradually with the passage of time, and the pressure loss of the exhaust gas style in a particulate filter becomes large gradually thus. If the pressure loss of an exhaust gas style becomes large, a power will decline, and while saying that a particulate filter must be thus exchanged for a new article at an early stage also from this point, a title arises.
[0010] Thus, since the above problems will arise once a lot of particles accumulate in the shape of a laminating, it is necessary to devise treatment so that the situation which a lot of particles deposit on a laminating may not be caused in consideration of the balance of the amount of particles contained in exhaust gas, and the amount of particles which may burn on a particulate filter.
[0011] However, only by preparing an exhaust air purification filter with a catalyst in an exhaust pipe, if it is continuous-combustion processing of the result in which he left exhaust air purification to an internal combustion engine's operation situation, the above problems are nonavoidable.
[0012] Then, since a particle will accumulate on the both-sides side of a filter if it can be made to carry out by turns at the filter of a purge change-over passage of exhaust air from the exhaust air upstream and the downstream so that the continuous combustion of a particle may become possible as much as possible, the alimentation per unit area of a particle can be reduced. Moreover, oxidation of a particle can be promoted by carrying out disturbance of the particle deposited by change-over of an exhaust gas style, and flying it. In this case, it is NOx to filter base material. If the absorbent was formed, when it becomes a situation with much oxygen into exhaust gas, it is NOx in exhaust gas. It absorbs, and by supplying a reducing agent, this can be emitted and returned and can also be purified.
[0013] Thus, removal and NOx of a particle In order to purify to coincidence, it is NOx to filter base material. With the exhaust air purification filter which formed the absorbent When the oxidation engine performance of the particle in a filter may be reduced, (for example, when the time of moderation operation of a car or fuel oil consumption is smallness) It is possible to adopt the system which is made to bypass a filter and passes exhaust gas, in order to prevent that the particle more than the amount of setup accumulates on a filter, and NOx near the filter at this time. It is possible to install the reducing-agent feeder which supplies a reducing agent.
[0014] Moreover, it is NOx only when the time of moderation operation or fuel oil consumption is smallness. If reduction control shall be performed, it sets at the time of continuous high-speed transit, and is NOx. It is NOx when the need for reduction arises. The problem that reduction control cannot be performed arises. Then, an operation situation is embraced and it is NOx. The system which can perform reduction control is called for.
[0015] Furthermore, NOx It is NOx in the case of reduction. When it considers as the equipment which supplies a fuel (hydrocarbon HC) as a reducing agent, a lot of fuels stick to a filter at the time of supply of a reducing agent. And NOx If exhaust gas is immediately passed in a filter after emission and reduction termination, HC which has not oxidized will be emitted outside so much and is not desirable.
[0016] It was made in view of the above situations, and this invention is NOx. Oxidation of reduction and a particle can be more effectively performed according to an operation situation, and it is NOx. Let it be a technical problem to offer the exhaust emission control device of the internal combustion engine which can control being emitted without reducing agents, such as a fuel, oxidizing after reduction termination.
[0017]
[Means for Solving the Problem] The following means was used for the exhaust emission control device of the internal combustion engine of this invention in order to attain the above-mentioned technical problem.
[0018] Namely, the NOx absorbent which emits NOx absorbed when invention concerning this application absorbed NOx when the air-fuel ratio of the flowing exhaust gas was Lean, and the oxygen density in the flowing exhaust gas fell, The active oxygen emission agent which promotes oxidation of the particle in exhaust

gas is supported. The particle in exhaust gas The filter which can temporarily be captured, The 1st flow which passes exhaust gas from the one side of said filter, and the 2nd flow which passes exhaust gas from the other side of said filter can be switched by turns. The exhaust air means for switching passed to the bypass path where exhaust gas bypasses said filter in the middle of a change, The reducing-agent supply means established between the branch point of the flueway switched by turns by this exhaust air means for switching in the flow of exhaust air, and the flueway of said filter upstream, When it is expected that the amount of particle oxidation removal of said filter becomes small While controlling said exhaust air means for switching to lead said a part of exhaust gas to said filter through the flueway of the side which supplies said reducing agent, and to pass other exhaust gas to said bypass path It is characterized by having the control means which controls said reducing-agent supply means to supply said reducing agent that said filter should be made reducing atmosphere.

[0019] An exhaust air means for switching can constitute the flow direction of the exhaust gas in said filter from a switchable exhaust air change-over valve to forward hard flow. In addition, with the reducing atmosphere of a filter, it considers as the condition of giving an inclination a little to an exhaust air change-over valve from the mid-position, and passing exhaust gas to a bypass path, and the flow of **** kana exhaust gas is produced in an exhaust emission control device with the inclination of an exhaust air change-over valve. Then, if it will be in the condition that the tooth-space velocity (it is called the index which shows what time [of the volume of a filter] gas flows to unit time amount, and Following SV) fell and a reducing agent is supplied to a filter in the state of this low SV, NOx can be emitted in few amount of reducing agents.
[0020] Thus, since a low SV condition is aimed at and a reducing-agent provisioning process is carried out, NOx effectively absorbed by the filter can be made to emit.
[0021] Moreover, for invention concerning this application, when it is expected that the amount of particle oxidation removal of said filter becomes small, the time of moderation of a car or fuel oil consumption is smallness (a fuel cut is included). You may constitute so that it may be a case.
[0022] Furthermore, when the condition below the set point does not arise beyond over predetermined time, it leads said a part of exhaust gas to said filter compulsorily, and the time of moderation of said car or fuel oil consumption may constitute the control means of invention concerning this application so that said reducing-agent supply means may be controlled to supply said reducing agent that it should make the reducing atmosphere of said filter, while controlling said exhaust air means for switching to pass other exhaust gas to said bypass path.
[0023] According to this configuration, even if it is the case where the flow rate of exhaust gas is not passed to a bypass path like [at the time of high-speed transit] for a long time, NOx emission processing can be performed compulsorily. In addition, the timing which performs such NOx emission processing is made to perform compulsorily, when NOx absorbed, for example exceeds an allowed value.
[0024] As the judgment approach of an NOx allowed value, the amount of NOx by which occlusion is carried out to the NOx absorbent based on an internal combustion engine's operation hysteresis (deflection of the execution time of lean combustion operation and SUTOIKI operation time) is presumed, for example. The approach of judging based on the output signal value of an NOx sensor in case the air-fuel ratio of the exhaust air which flows into the approach of judging by measuring the maximum amount of NOx in which an NOx absorbent can carry out occlusion to the estimate, or a filter is a predetermined air-fuel ratio etc. can be illustrated.
[0025] Furthermore, the control means of invention concerning this application is crossed to the predetermined time after supply termination of said reducing agent, leads said a part of exhaust gas to said filter, and it constitutes it so that control which maintains said exhaust air means for switching so that other exhaust gas may be passed to said bypass path may be performed.
[0026] Since a reactant low fuel component is included in the reducing agent supplied in many cases, much HC remains in the filter after reducing-agent supply termination. When an exhaust air means for switching is operated immediately and the flow of exhaust gas is switched after reducing-agent supply termination in this condition, there is risk of HC being emitted outside. Then, in order to control emission of HC, after reducing-agent supply termination holds an exhaust air means for switching in the location at the time of supply of a reducing agent over a predetermined period, incorporates the exhaust gas of Lean containing oxygen in a filter, and it is made to promote oxidation of HC. However, sudden acceleration etc. enters, and when the exhaust gas

which contains a particle so much occurs, in order to prevent particle emission, cancel the maintenance condition of an exhaust air means for switching, and exhaust gas is made to flow into a filter, and you may make it capture a particle.
[0027] Moreover, the NOx absorbent which emits NOx absorbed when invention concerning this application absorbed NOx when the air-fuel ratio of the flowing exhaust gas was Lean, and the oxygen density in the flowing exhaust gas fell, The active oxygen emission agent which promotes oxidation of the particle in exhaust gas is supported. The particle in exhaust gas Two or more filters which can temporarily be captured, The 1st flow which passes exhaust gas from the one side of said filter, and the 2nd flow which passes exhaust gas from the other side of said filter can be switched by turns. The exhaust air means for switching passed to the bypass path where exhaust gas bypasses said filter in the middle of a change, When it is expected that a reducing-agent supply means to supply a reducing agent among said two or more filters, and the amount of particle oxidation removal of said filter become small While controlling said exhaust air means for switching to pass said exhaust gas to said bypass path, it is characterized by having the control means which controls said reducing-agent supply means to supply said reducing agent that said filter should be made reducing atmosphere.
[0028] It is in-series to an exhaust emission control device, and it is equipped with a filter two pieces, if the reducing-agent feeder which prepared supply of a reducing agent between two filters performs, reducing atmosphere is formed between filters and this attains to the filter. Therefore, in order to make a filter into reducing atmosphere, it is not necessary to lean an exhaust air change-over valve so that a part of exhaust gas may be made to flow into a filter, and if an exhaust air change-over valve is completely controlled in a center valve position, control of an exhaust air change-over valve will become easy by that of **.
[0029]
[Embodiment of the Invention] Hereafter, the gestalt of operation of the exhaust emission control device of the internal combustion engine concerning this invention is explained with reference to the drawing of drawing 10 from drawing 1 .
<Outline of equipment configuration> drawing 1 shows the case where this invention is applied to the compression ignition type internal combustion engine for cars. In addition, this invention is also applicable also to a jump-spark-ignition type internal combustion engine.
[0030] if drawing 1 is referred to -- 1 -- an engine body and 2 -- a cylinder block and 3 -- the cylinder head and 4 -- a piston and 5 -- in an inlet valve and 8, a suction port and 9 show an exhaust valve and, as for a combustion chamber and 6, 10 shows [an electric control type fuel injection valve and 7] an exhaust air port, respectively. A suction port 8 is connected with a surge tank 12 through the corresponding inhalation-of-air branch pipe 11, and a surge tank 12 is connected with the compressor 15 of the exhaust air turbocharger 14 through an air intake duct 13. In an air intake duct 13, the throttle valve 17 driven with a step motor 16 is arranged, and the cooling system 18 for cooling the inhalation air which flows the inside of an air intake duct 13 is arranged further at the circumference of an air intake duct 13. the example shown in drawing 1 -- engine cooling water -- the inside of a cooling system 18 -- **** -- inhalation air is cooled with him and engine cooling water. On the other hand, the exhaust air port 10 is connected with the exhaust gas turbine 21 of the exhaust air turbocharger 14 through an exhaust manifold 19 and an exhaust pipe 20, and the outlet of an exhaust gas turbine 21 is connected with the exhaust emission control device which has the casing 23 which built in the particulate filter 22.
[0031] It connects with each other through the exhaust gas recycling (EGR is called hereafter) path 24 as an exhaust manifold 19 and a surge tank 12, and the electric control type EGR control valve 25 is arranged at the EGR path 24. Moreover, the cooling system 26 for cooling the EGR gas which flows the inside of the EGR path 24 is arranged at the circumference of the EGR path 24. the example shown in drawing 1 -- engine cooling water -- the inside of a cooling system 26 -- **** -- EGR gas is cooled with him and engine cooling water. On the other hand, each fuel injection valve 6 is connected with a fuel reservoir and the so-called common rail 27 through fuel-feeding-pipe 6a. The fuel which the fuel was supplied into this common rail 27 from the strange fuel pump 28 with the good discharge quantity of an electric control type, and was supplied in the common rail 27 is supplied to a fuel injection valve 6 through each fuel-feeding-pipe 6a. The fuel pressure sensor 29 for detecting the fuel pressure in a common rail 27 to a common rail 27 is attached, and the discharge quantity of a fuel pump 28 is controlled so that the fuel pressure in a common rail 27 turns into target fuel pressure based on the output signal of the fuel pressure sensor 29.

[0032] An electronic control unit 30 consists of a digital computer, and ROM (read-only memory)32, RAM (random access memory)33, CPU (microprocessor)34, the input port 35, and the output port 36 which were mutually connected by the bidirectional bus 31 are provided. The output signal of the fuel pressure sensor 29 is inputted into input port 35 through corresponding A-D converter 37. Moreover, the temperature sensor 39 for detecting the temperature of a particulate filter 22 to a particulate filter 22 is attached, and the output signal of this temperature sensor 39 is inputted into input port 35 through corresponding A-D converter 37. The load sensor 41 which generates the output voltage proportional to the amount L of treading in of an accelerator pedal 40 is connected to an accelerator pedal 40, and the output voltage of the load sensor 41 is inputted into input port 35 through the corresponding converter 37. Furthermore, whenever 30 degrees rotates, the crank angle sensor 42 which generates an output pulse is connected to input port 35 for a crankshaft. On the other hand, an output port 36 is connected to a fuel injection valve 6, the step motor 16 for a throttle-valve drive, the EGR control valve 25, a fuel pump 28, and the actuator 72 mentioned later through the corresponding drive circuit 38.
[0033] Drawing 2 (A) indicates the amount L of treading in of an accelerator pedal 40, and relation with the engine rotational frequency N to be the demand torque TQ. In addition, in drawing 2 (A), each curve expresses the ** torque curve, as for the curve shown by TQ=0, torque shows that it is zero, and, as for the remaining curve, demand torque becomes high gradually at the order of TQ=a, TQ=b, TQ=c, and TQ=d. The demand torque TQ shown in drawing 2 (A) is beforehand memorized in ROM32 in the form of a map as a function of the amount L of treading in of an accelerator pedal 40, and the engine rotational frequency N, as shown in drawing 2 R> 2 (B). In the example by this invention, the demand torque TQ according to the amount L of treading in of an accelerator pedal 40 and the engine rotational frequency N is first computed from the map shown in drawing 2 R> 2 (B), and fuel oil consumption etc. is computed based on this demand torque TQ.
[0034] As the <structure of exhaust emission control device> exhaust emission control device was shown in drawing 1 , drawing 3 , and drawing 4 , the exhaust pipe 70 is connected to the outlet of an exhaust gas turbine 21. It branches from this exhaust pipe 70, and the 1st flueway 76 and 2nd flueway 77 which are connected, respectively are established in one field of this filter 22 and the field of another side in the casing 23 which built in the particulate filter 22. Furthermore, the bypass path 73 which discharges exhaust gas as it is, without passing a particulate filter 22 from the junction of the 1st flueway 76 and the 2nd flueway 77 is formed.
[0035] And the exhaust air change-over valve 71 is formed in the branch point of the 1st flueway 76 and the 2nd flueway 77. The exhaust air change-over valve 71 is driven with an actuator 72, and switches by turns the 1st flow (forward feed) which chooses the 1st flueway 76 and passes exhaust gas from the one side of a filter 22, and the 2nd flow (back flow) which chooses the 2nd flueway 77 and passes exhaust gas from the other side of a filter 22. Furthermore, the fuel addition nozzle 80 as a reducing-agent supply means to inject a fuel is formed into the exhaust gas which flows into a filter 22 in said 1st flueway 76. This fuel addition nozzle 80 is controlled by the control means 75 realized on CPU34 of an electronic control unit 30.
[0036] Here, the casing 23 which holds a filter 22 is arranged so that it may be located right above the exhaust pipe 70 which forms the bypass path 73, and it serves as the form where the 1st flueway 76 which branched from the exhaust pipe 70 on both sides of the casing 23, and the 2nd flueway 77 are connected. And as for the filter 22 in casing 23, when the passage direction of exhaust gas is made into the die-length direction, the die length of the cross direction which intersects perpendicularly in the die-length direction has become longer than die-length lay length. By considering as such a configuration, the loading tooth space to the car of the exhaust emission control device which consists of casing 23 which connotes a filter 22 can be made space-saving.
[0037] Drive control is carried out by the control means 75 realized on CPU34 of an electronic control unit 30, and an actuator 72 is driven with the control signal from an output port 36. Moreover, an actuator 72 is what is driven with the negative pressure formed with a drive of an internal combustion engine. A valve element is controlled in the location (forward feed location) which chooses the 1st flueway 76 when negative pressure is not applied. When the 1st negative pressure is applied, a valve element is controlled in a center valve position, and when the 2nd strong negative pressure is applied rather than the 1st negative pressure, a valve element is controlled in the location (back flow location) which chooses the 2nd flueway 77. While it can also hold in the inclined condition (middle inclination location) that the two-dot chain line of drawing 3 shows a valve element and this furthermore bypasses a part of exhaust gas to the bypass path 73 by control of negative pressure, other parts can be passed in a filter 22. That is, the exhaust air change-over valve 71 driven with the actuator 72

controlled by the control means 75 is an exhaust air means for switching as used in the field of this invention.
[0038] since the exhaust air change-over valve 71 connects the 2nd flueway 77 to the bypass path 73 while connecting an exhaust pipe 70 to the 1st flueway 76 when said valve element is in the forward feed location shown with the broken line of drawing 3 -- exhaust gas -- exhaust pipe 70-> -- 1st flueway 76 -> filter 22-> -- it flows in order of the 2nd flueway 77 -> bypass path 73, and is emitted to atmospheric air.
[0039] since the exhaust air change-over valve 71 connects the 1st flueway 76 to the bypass path 73 while connecting an exhaust pipe 70 to the 2nd flueway 77 when a valve element is in the back flow location shown as the continuous line of drawing 3 -- exhaust gas -- exhaust pipe 70-> -- 2nd flueway 77 -> filter 22-> -- it flows in order of the 1st flueway 76 -> bypass path 73, and is emitted to atmospheric air.
[0040] When a valve element is in the center valve position which became parallel to the axis of an exhaust pipe 70 as the alternate long and short dash line of drawing 3 showed, since the exhaust air change-over valve 71 connects an exhaust pipe 70 to the direct bypass path 73, exhaust gas flows to the bypass path 73 without passing a filter 22 from an exhaust pipe 70, and is emitted to atmospheric air.
[0041] When a valve element is in the middle inclination location which became parallel to the axis of an exhaust pipe 70 as the two-dot chain line of drawing 3 showed, since the exhaust air change-over valve 71 connects an exhaust pipe 70 to the bypass path 73, in the limitation, a part of exhaust gas flows to the bypass path 73 without passing a filter 22 from an exhaust pipe 70, and it is emitted to atmospheric air. On the other hand, a part of other exhaust gas passes a filter 22 from forward feed through the 1st flueway 76, and it is introduced by the inclination of a valve element at the bypass path 73.
[0042] In this condition, the amount of the exhaust gas which flows the 1st flueway 76 becomes less, and it will be in the condition that SV value fell. If a fuel is supplied to a filter in this condition, active oxidation reaction arises, filter temperature rises, and oxidation of a particle can be promoted.
[0043] By the change of a valve element, by repeating forward feed and a back flow, since particles, such as soot, move about the inside of the base material of a filter 22, oxidation of a particle can be promoted and, therefore, a particle can be purified efficiently.
[0044] Drawing 5 (A) is an image Fig. in the case of passing exhaust gas only from an one direction in a filter 22, and a particle is accumulated, and does not move only to one field of a filter, but it not only becomes the cause of the pressure drop buildup of exhaust gas, but it bars purification of a particle.
[0045] Drawing 5 (B) is an image Fig. in the case of passing exhaust gas from both directions in a filter 22, since disturbance of the particle is carried out in the direction of forward feed, and the back flow direction by both sides of a filter, they is both sides of a filter 22, or it can be moved about it inside a base material, it can promote oxidation of a particle using the active spot of the whole filter base material, and can lessen more that a particle is accumulated in a filter 22. Therefore, the pressure drop buildup of exhaust gas is avoidable.
[0046] The structure of a particulate filter 22 is shown in <structure of filter> drawing 6 . In addition, in drawing 6 , (A) shows the front view of a particulate filter 22, and (B) shows the side-face sectional view of a particulate filter 22. As shown in drawing 6 (A) and (B), the particulate filter 22 is making honeycomb structure, and it is the so-called Wall flow mold possessing two or more exhaust air circulation ways 50 and 51 which are mutually parallel and extend. These exhaust air circulation way is constituted by the exhaust gas inflow path 50 where the down-stream edge was blockaded with the plug 52, and the exhaust gas outflow path 51 where the upper edge was blockaded with the plug 53. In addition, the part which attached hatching in drawing 6 (A) shows the plug 53. Therefore, the exhaust gas inflow path 50 and the exhaust gas outflow path 51 are arranged by turns through the septum 54 of thin meat. If it says and changes, the exhaust gas inflow path 50 and the exhaust gas outflow path 51 will be arranged so that each exhaust gas inflow path 50 may be surrounded by four exhaust gas outflow paths 51 and each exhaust gas outflow path 51 may be surrounded by four exhaust gas inflow paths 50.
[0047] A particulate filter 22 flows out for example, in the exhaust gas outflow path 51 which adjoins through the inside of the surrounding septum 54 as the exhaust gas which is formed from a porous material like a cordylite, therefore flowed in the exhaust gas inflow path 50 is shown by the arrow head in drawing 6 (B).
[0048] In the example by this invention, the peripheral wall side of each exhaust gas inflow path 50 and each exhaust gas outflow path 51, The layer of the support which consists of an alumina is formed on the pore internal surface on the both-sides front face of each septum 54, and in a septum 54. On this support Namely, a precious metal catalyst, The active oxygen emission agent which emits the oxygen held when oxygen was

incorporated when excess oxygen existed in the perimeter, oxygen was held and the surrounding oxygen density fell in the form of active oxygen, The NOx absorbent and ** which emit NOx absorbed when the air-fuel ratio of the flowing exhaust gas was Lean and the oxygen density in the exhaust gas which absorbs NOx and flows fell are ****(ed).

[0049] Here, the air-fuel ratio of the exhaust gas which flows into an NOx absorbent means the ratio of the air supplied in the flueway in an engine inhalation-of-air path, a combustion chamber 5, and the NOx absorbent upstream, and a fuel (hydrocarbon). In addition, when a fuel (hydrocarbon) or air is not supplied in the flueway of the NOx absorbent upstream, the air-fuel ratio of inflow exhaust gas is in agreement with the air-fuel ratio of the gaseous mixture supplied to a combustion chamber.

[0050] Platinum Pt can be used as said precious metal catalyst. Said active oxygen emission agent can consist of at least one chosen from alkaline earth metal like Potassium K, Sodium Na, Lithium Li, SESHIMU Cs, alkali metal like Rubidium Rb, Barium Ba, Calcium calcium, and Strontium Sr, Lanthanum La, rare earth like Yttrium Y, and transition metals.

[0051] In addition, it is desirable to use a high alkali metal or a high alkaline earth metal K, i.e., the potassium, Lithium Li, Caesium Cs, Rubidium Rb and Barium Ba of an ionization tendency, and Strontium Sr as an active oxygen emission agent in [Calcium / calcium] this case.

[0052] Said NOx absorbent can consist of at least one chosen from an alkaline earth like Potassium K, Sodium Na, Lithium Li, Caesium Cs, alkali metal like Rubidium Rb, Barium Ba, Calcium calcium, and Strontium Sr, Lanthanum La, and rare earth like Yttrium Y.

[0053] In addition, it is desirable to use a high alkali metal or a high alkaline earth metal K, i.e., the potassium, Lithium Li, Caesium Cs, Rubidium Rb and Barium Ba of an ionization tendency, and Strontium Sr as an NOx absorbent in [Calcium / calcium] this case.

[0054] Most of the metal which constitutes these corresponds so that it may understand, if the metal which constitutes an active oxygen emission agent is compared with the metal which constitutes an NOx absorbent. Therefore, a metal which is different as an active oxygen emission agent and an NOx absorbent, respectively can also be used, and the same metal can also be used. When the metal same as an active oxygen emission agent and an NOx absorbent is used, this metal will achieve the function of the both sides of the function as an active oxygen emission agent, and the function as an NOx absorbent to coincidence. Thus, what achieves the function of the both sides of the function of an active oxygen emission agent and the function of an NOx absorbent to coincidence is hereafter called "active oxygen emission and an NOx absorbent."

[0055] And the gestalt of this operation explains Platinum Pt on support, such as an alumina, taking the case of the case where Potassium K is ****(ed) as active oxygen emission and an NOx absorbent, as a precious metal catalyst.

[0056] As mentioned above, the potassium K as active oxygen emission and an NOx absorbent achieves the function as an active oxygen emission agent, and the function of the both sides of the function as an NOx absorbent to coincidence, in this exhaust emission control device, aims at promotion of oxidation removal of the particle in exhaust gas using the function as an active oxygen emission agent, and is purifying NOx in exhaust gas using the function as an NOx absorbent. Hereafter, paying attention to each function, the purification mechanism in this exhaust emission control device is explained.

[0057] Continuation oxidation treatment of a particle with < filter ... The particle removal operation in the exhaust gas by the particulate filter 22 using the function as an active oxygen emission agent of active oxygen emission and an NOx absorbent is explained at the beginning of function > as an active oxygen emission agent. In addition, even if the function as this active oxygen emission agent uses other alkali metal, alkaline earth metal, rare earth, and transition metals as an active oxygen emission agent, a particle removal operation is performed by the same mechanism.

[0058] In the compression ignition type internal combustion engine as shown in drawing 1 , combustion is performed by the basis with superfluous air, therefore exhaust gas includes a lot of excess airs. That is, in the compression ignition type internal combustion engine as shown in drawing 1 , the air-fuel ratio of exhaust gas serves as Lean. Moreover, in the combustion chamber 5, since NO occurs, NO is contained in exhaust gas. Moreover, Sulfur S is contained in the fuel, this sulfur S reacts with oxygen in a combustion chamber 5, and it is SO2. It becomes. Therefore, in exhaust gas, it is SO2. It is contained. Therefore, excess oxygen, and NO and SO2 The included exhaust gas will flow in the exhaust gas inflow path 50 of a particulate filter 22.

[0059] Drawing 7 (A) and (B) express typically the enlarged drawing of the front face of the support layer formed on the inner skin of the exhaust gas inflow path 50, and the pore internal surface in a septum 54. In addition, in drawing 7 (A) and (B), 60 shows the particle of Platinum Pt, and 61 shows the active oxygen emission and the NOx absorbent containing Potassium K.
[0060] Since a lot of excess oxygen is contained in exhaust gas as mentioned above, when exhaust gas flows in the exhaust gas inflow path 50 of a particulate filter 22, as it is shown in drawing 7 (A), it is these oxygen O2. It adheres to the front face of Platinum Pt in the form of O2- or O2-. On the other hand, NO in exhaust gas reacts with O2- or O2- on the front face of Platinum Pt, and is NO2. It becomes (2 NO+O2 ->2NO2). Subsequently, generated NO2 Diffusing a part in active oxygen emission and the NOx absorbent 61 in the form of nitrate ion NO3-, as shown in drawing 7 (A) being absorbed in active oxygen emission and the NOx absorbent 61, and combining with Potassium K oxidizing on Platinum Pt, a part of nitrate ion NO3- generates a potassium nitrate KNO3.
[0061] On the other hand, as mentioned above, in exhaust gas, it is SO2. It is contained and is this SO2. It is absorbed in active oxygen emission and the NOx absorbent 61 by the same mechanism as NO. That is, as mentioned above, it is oxygen O2. It has adhered to the front face of Platinum Pt in the form of O2- or O2-, and is SO2 in exhaust gas. It reacts with O2- or O2- on the front face of Platinum Pt, and is set to SO3.
[0062] Subsequently, generated SO3 A part is diffused in active oxygen emission and the NOx absorbent 61 in the form of sulfate ion SO42-, being absorbed in active oxygen emission and the NOx absorbent 61, and combining with Potassium K oxidizing further on Platinum Pt, and generates potassium sulfate K2SO4. Thus, in active oxygen emission and the NOx absorbent 61, it is a potassium nitrate KNO3. And potassium sulfate K2SO4 It is generated.
[0063] On the other hand, the particle which mainly consists of carbon C in a combustion chamber 5 is generated, therefore these particles are contained in exhaust gas. On the front face of a support layer, for example, the front face of active oxygen emission and the NOx absorbent 61, these particles contained in exhaust gas contact and adhere, as drawing 7 (B) shown in 62 when going to the exhaust gas outflow path 51 from the exhaust gas inflow path 50 while exhaust gas is flowing the inside of the exhaust gas inflow path 50 of a particulate filter 22 or.
[0064] Thus, if a particle 62 adheres on the front face of active oxygen emission and the NOx absorbent 61, an oxygen density will fall in the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61. If an oxygen density falls, a concentration difference arises between the inside of high active oxygen emission and NOx absorbent 61 of an oxygen density, and the oxygen in active oxygen emission and the NOx absorbent 61 tends to move towards the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61 thus. Consequently, potassium nitrate KNO3 currently formed in active oxygen emission and the NOx absorbent 61 It is decomposed into Potassium K and Oxygen O and NO, and NO is emitted outside for Oxygen O from active oxygen emission and the NOx absorbent 61 toward the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61. NO emitted outside oxidizes on the platinum Pt of the downstream, and is again absorbed in active oxygen emission and the NOx absorbent 61.
[0065] On the other hand, potassium sulfate K2SO4 currently formed in active oxygen emission and the NOx absorbent 61 at this time is also Potassium K and oxygen O and SO2. It is decomposed, Oxygen O goes to the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61, and it is SO2. It is emitted outside from active oxygen emission and the NOx absorbent 61. SO2 emitted outside It oxidizes on the platinum Pt of the downstream and is again absorbed in active oxygen emission and the NOx absorbent 61. However, since it is stabilizing, potassium sulfate K2SO4 is a potassium nitrate KNO3. It compares and emits and is ******.
[0066] On the other hand, the oxygen O which goes to the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61 is a potassium nitrate KNO3. It is oxygen decomposed from a compound like potassium sulfate K2SO4. The oxygen O decomposed from the compound has high energy, and has very high activity. Therefore, the oxygen which goes to the contact surface of a particle 62, and the active oxygen emission and an NOx absorbent 61 is active oxygen O. If these active oxygen O contacts a particle 62, a particle 62 will be made to oxidize, without emitting a luminous flame to the inside of a short time, and a particle 62 will disappear completely. Therefore, a particle 62 is not deposited on a particulate filter 22.

[0067] When the particle deposited in the shape of a laminating on the particulate filter 22 like before is made to burn, a particulate filter 22 becomes red-hot, and it burns with a flame. In order not to maintain it unless the combustion accompanied by such a flame is an elevated temperature, therefore to make the combustion accompanied by such a flame maintain, ****** of a particulate filter 22 must be maintained to an elevated temperature.
[0068] On the other hand, in this invention, a particle 62 is made to oxidize, without emitting a luminous flame, as mentioned above, and the front face of a particulate filter 22 does not burn at this time. That is, if it says and changes, in this invention, a particle 62 will carry out oxidation removal to it being also at quite low temperature compared with the former. Therefore, the particle removal operation by oxidation of the particle 62 which does not emit the luminous flame by this invention completely differs from the particle removal operation by the conventional combustion accompanied by a flame.
[0069] Moreover, the particle removal operation by oxidation of a particle is considerably performed at low temperature. Therefore, the temperature of a particulate filter 22 does not rise so much, but there is almost no danger that a particulate filter 22 will deteriorate thus. Moreover, since a particle hardly accumulates on a particulate filter 22, there are few dangers that the ash which is the cinder of a particle will condense, therefore the danger that a particulate filter 22 will carry out blinding decreases.
[0070] By the way, this blinding is mainly produced with a calcium sulfate $CaSO_4$. That is, the fuel and the lubricating oil contain Calcium calcium, therefore Calcium calcium is contained in exhaust gas. This calcium calcium is SO_3. Existence generates a calcium sulfate $CaSO_4$. This calcium sulfate $CaSO_4$ is a solid-state, and even if it becomes an elevated temperature, it is not pyrolyzed. Therefore, calcium sulfate $CaSO_4$ It is generated and is this calcium sulfate $CaSO_4$. Blinding will be produced when the pore of a particulate filter 22 is blockaded.
[0071] However, SO_3 which will be diffused in active oxygen emission and the NOx absorbent 61 if alkali metal with an ionization tendency higher than Calcium calcium or alkaline earth metal K, for example, a potassium, is used as active oxygen emission and an NOx absorbent 61 in this case It combines with Potassium K, potassium sulfate K_2SO_4 is formed, and Calcium calcium is SO_3. Without joining together, the septum 54 of a particulate filter 22 is passed and it flows out in the exhaust gas outflow path 51. Therefore, it is lost that the pore of a particulate filter 22 carries out blinding. Therefore, as mentioned above, as active oxygen emission and an NOx absorbent 61, it will be more desirable than Calcium calcium to use a high alkali metal or a high alkaline earth metal K, i.e., the potassium, Lithium Li, Caesium Cs, and Barium Ba of an ionization tendency.
[0072] By the way, since Platinum Pt, and active oxygen emission and an NOx absorbent 61 are activated so that the temperature of a particulate filter 22 becomes high, the amount of the active oxygen O which active oxygen emission and the NOx absorbent 61 may emit to per unit time amount increases, so that the temperature of a particulate filter 22 becomes high. Therefore, without emitting a luminous flame on a particulate filter 22 per unit time amount, the oxidization removable amount of particles in which oxidization removal is possible increases, so that the temperature of a particulate filter 22 becomes high.
[0073] The continuous line of drawing 9 shows the oxidation removable amount G of particles in which oxidation removal is possible, without emitting a luminous flame to per unit time amount. In addition, in drawing 9 , the axis of abscissa shows the temperature TF of a particulate filter 22. Oxidation removal is carried out without emitting a luminous flame on the particulate filter 22 to the inside of a short time, as soon as all the particles by which this amount M of discharge particles was discharged from the combustion chamber 5 in the field I of drawing 9 when fewer than the oxidation removable particle G will contact a particulate filter 22, if the amount of the particle discharged by per unit time amount from a combustion chamber 5 is called the amount M of discharge particles.
[0074] On the other hand, when [than the oxidation removable amount G of particles] more, in the field II of drawing 9 , the amount of active oxygen wants the amount M of discharge particles for oxidizing all particles. Drawing 8 (A) - (C) shows the situation of oxidation of the particle in such a case.
[0075] That is, the particle part which a part of particle 62 oxidized when the amount of active oxygen was insufficient for oxidizing all particles and the particle 62 adhered on active oxygen emission and the NOx absorbent 61 as shown in drawing 8 (A), and did not fully oxidize remains on a support layer. Subsequently, if the condition that the amounts of active oxygen are insufficient continues, the particle part which did not oxidize from a degree to a degree will remain on a support layer, and as shown in drawing 8 (B) as a result, the

front face of a support layer will come to be covered with the residual particle part 63.
[0076] This residual particle part 63 that covers the front face of a support layer deteriorates in the quality of carbon which cannot oxidize easily gradually, and this residual particle part 63 becomes easy to remain as it is thus. Moreover, NO by Platinum Pt and SO2 if the front face of a support layer is covered with the residual particle part 63 The oxidation and an emission operation of the active oxygen by active oxygen emission and the NOx absorbent 61 are controlled. Consequently, as shown in drawing 8 (C), another particle 64 accumulates from a degree on the residual particle part 63 to a degree. That is, a particle will accumulate in the shape of a laminating. Thus, if a particle accumulates in the shape of a laminating, since these particles have separated distance from Platinum Pt, or active oxygen emission and an NOx absorbent 61, even if they are particles which are easy to oxidize even if, they will not oxidize by active oxygen O any longer, therefore still more nearly another particle will deposit them from a degree on this particle 64 to a degree. That is, if more conditions than the oxidization removable amount G of particles continue [the amount M of discharge particles], on a particulate filter 22, a particle will accumulate in the shape of a laminating.
[0077] Thus, a particle is made to oxidize in the field I of drawing 9 by the inside of a short time, without emitting a luminous flame on a particulate filter 22, and a particle accumulates in the shape of a laminating on a particulate filter 22 in the field II of drawing 9 . Therefore, in order to make it a particle not accumulate in the shape of a laminating on a particulate filter 22, it is desirable to always make relation with the oxidation removable amount G of particles into the range of Field I for the amount M of discharge particles.
[0078] However, it is almost impossible to make the amount M of discharge particles in fact fewer than the oxidation removable amount G of particles in all operational status. For example, at the time of engine starting, the temperature of a particulate filter 22 is usually low, therefore the amount M of discharge particles usually increases more than the oxidation removable amount G of particles at this time. If the direction of the amount M of discharge particles seems to increase more than the oxidization removable amount G of particles immediately after engine starting, the particle part which did not oxidize on the particulate filter 22 will begin to remain.
[0079] Thus, it may increase depending on [amount / oxidization removable / of particles / G] an operation situation, and a particle may deposit the amount M of discharge particles in the shape of a laminating on a particulate filter 22.
[0080] In order to carry out oxidation removal of this deposited particle, the change-over valve 71 arranged at the exhaust pipe 70 is switched. If a change-over valve 71 is switched, the exhaust air upstream and the exhaust air downstream of a particulate filter 22 are reversed, before a switch, in the part which was the exhaust air downstream of a particulate filter 22, a particle will adhere to the front face of active oxygen emission and the NOx absorbent 61, active oxygen O will be emitted, and oxidation removal of this particle will be carried out. A part of this active oxygen O emitted moves to the exhaust air downstream of a particulate filter 22 with exhaust gas, and it carries out oxidation removal of the particle deposited here. Here, as mentioned above, disturbance of the particle is carried out in the direction of forward feed, and the back flow direction by both sides of a particulate filter 22, and they are both sides of a particulate filter 22, or moves about inside a base material, and meets and oxidizes to the active spot of the whole filter base material.
[0081] Thus, when the particle which did not oxidize is beginning to accumulate on a particulate filter 22, oxidization removal of the particle can be completely carried out from a particulate filter 22 by reversing the exhaust air upstream and the downstream of this particulate filter 22.
[0082] Moreover, it is made to oxidize by making rich temporarily a part of exhaust gas or the whole air-fuel ratio, when a particle accumulates on a particulate filter 22, without the deposited particle emitting a luminous flame. Combustion removal is carried out at a stretch for a short time, without the particle deposited by the active oxygen O which active oxygen O was emitted outside at a stretch from active oxygen emission and the NOx absorbent 61, and was emitted to these breath emitting a luminous flame, if the air-fuel ratio of exhaust gas is made rich (i.e., if the oxygen density in exhaust gas is made to fall). The above is a particle purification mechanism using the function as an active oxygen emission agent of active oxygen emission and an NOx absorbent.
[0083] NOx purification processing by < active oxygen emission and the NOx absorbent ... The NOx cleaning effect using the function as function [as an NOx **** agent] >, next an NOx absorbent of active oxygen emission and an NOx absorbent is explained. In addition, even if the function as this NOx absorbent uses other alkali metal, alkaline earth metal, and rare earth as an NOx absorbent, an NOx cleaning effect is performed by

the same mechanism.
[0084] It is thought that the NOx cleaning effect of active oxygen emission and an NOx absorbent is performed by the mechanism as shown in drawing 10 . In addition, in drawing 10 (A) and (B), 60 shows the particle of Platinum Pt, and 61 shows the active oxygen emission and the NOx absorbent containing Potassium K.
[0085] First, as the oxygen density in inflow exhaust gas will increase sharply if the air-fuel ratio of inflow exhaust gas becomes Lean considerably, and shown in drawing 10 (A), it is oxygen O2. It adheres to the front face of Platinum Pt in the form of O2- or O2-. On the other hand, NO contained in inflow exhaust gas reacts with O2- or O2- on the front face of Platinum Pt, and is NO2. It becomes (2 NO+O2 ->2NO2).
[0086] Subsequently, generated NO2 Being absorbed in active oxygen emission and the NOx absorbent 61, and combining with Potassium K oxidizing on Platinum Pt, as shown in drawing 10 (A), it is spread in active oxygen emission and the NOx absorbent 61 in the form of nitrate ion NO3-. Thus, NOx is absorbed in active oxygen emission and the NOx absorbent 61.
[0087] As long as the oxygen density in inflow exhaust gas is high, it is NO2 in the front face of Platinum Pt. It is generated and is NOx of active oxygen emission and the NOx absorbent 61. It is NO2 unless absorptance is saturated. It is absorbed in active oxygen emission and the NOx absorbent 61, and nitrate ion NO3- is generated.
[0088] On the other hand, theoretical air fuel ratio or since the oxygen density in inflow exhaust gas will fall if it becomes rich, an exhaust air air-fuel ratio is NO2. The amount of generation falls, a reaction goes to hard flow (NO3-->NO2), and nitrate ion NO3- in active oxygen emission and the NOx absorbent 61 is emitted from active oxygen emission and the NOx absorbent 61 in the form of NO2 or NO. That is, a fall of the oxygen density in inflow exhaust gas will emit NOx from active oxygen emission and the NOx absorbent 61.
[0089] On the other hand, HC in exhaust gas and CO react with oxygen O2- on Platinum Pt, or O2-, and are made to oxidize at this time. moreover, NO2 or NO emitted by the fall of the oxygen density in inflow exhaust gas from active oxygen emission and the NOx absorbent 61 is shown in drawing 10 (B) -- as -- unburnt -- it reacts with HC and CO, and it is made to return and is set to N2.
[0090] That is, HC in inflow exhaust gas and CO react immediately with oxygen O2- on Platinum Pt, or O2- first, and are made to oxidize, and if HC and CO still remain even if oxygen O2- or O2- on Platinum Pt is subsequently consumed, NOx discharged by NOx and the internal combustion engine which were emitted by this HC and CO from active oxygen emission and the NOx absorbent 61 will be returned to N2.
[0091] thus, the front-face top of Platinum Pt -- NO2 or -- if NO stops existing -- the degree from the degree from active oxygen emission and the NOx absorbent 61 -- NO2 or NO emits -- having -- further -- N2 It is made to return. Therefore, if the air-fuel ratio of exhaust gas is made into theoretical air fuel ratio or Rich, NOx will be emitted to the inside of a short time from active oxygen emission and the NOx absorbent 61, and it is N2. It is returned.
[0092] Thus, if the air-fuel ratio of exhaust gas becomes Lean, NOx will be absorbed by active oxygen emission and the NOx absorbent 61, and if the air-fuel ratio of exhaust gas is made into theoretical air fuel ratio or Rich, NOx will be emitted to the inside of a short time from active oxygen emission and the NOx absorbent 61, and will be returned to N2. Therefore, discharge of NOx to the inside of atmospheric air can be prevented.
[0093] As mentioned above, by the way, in this compression ignition type internal combustion engine Usually, since combustion is performed in the Lean region farther than SUTOIKI (theoretical air fuel ratio, A/F=14.6) The air-fuel ratio of the exhaust gas (namely, exhaust gas which flows into active oxygen emission and the NOx absorbent 61) which flows into a filter 22 in the usual engine operational status is very Lean. There are very few amounts of NOx which NOx under exhaust air is absorbed by active oxygen emission and the NOx absorbent 61, and are emitted from active oxygen emission and the NOx absorbent 61.
[0094] Therefore, with a compression ignition type internal combustion engine, before the NOx absorptance of active oxygen emission and the NOx absorbent 61 is saturated, it is necessary to supply a reducing agent into exhaust gas, to make the oxygen density in exhaust gas fall, and to make NOx absorbed by active oxygen emission and the NOx absorbent 61 emit, and it necessary to return to N2 to predetermined timing.
[0095] Therefore, the amount of NOx in which ECU30 was absorbed by active oxygen emission and the NOx absorbent 61 from the hysteresis of an internal combustion engine's operational status is presumed, and he is trying to supply a reducing agent with the gestalt of this operation, when that amount of presumed NOx reaches the predetermined value set up beforehand at the same time it makes the air-fuel ratio of exhaust gas rich

temporarily and makes an oxygen density fall. Thus, generally it has called it the rich spike to make the air-fuel ratio of exhaust gas rich temporarily.
[0096] With the gestalt of this operation, when an internal combustion engine's expansion line is set like an exhaust air line and subinjects a fuel in a gas column, a rich spike is realized. In addition, a rich spike is realizable also by supplying a fuel in the upstream flueway 70 from a filter 22.
[0097] Thus, before the NOx absorptance of active oxygen emission and the NOx absorbent 61 is saturated, by performing a rich spike to predetermined timing, NOx in exhaust gas can be purified continuously and it can prevent making NOx emit to atmospheric air. The above is an NOx purification mechanism using the function as an NOx **** agent of active oxygen emission and the NOx absorbent 61.
[0098] Therefore, the active oxygen to which this particle will be emitted from active oxygen emission and the NOx absorbent 61 if the particle which NOx contained in exhaust gas when the air-fuel ratio of the exhaust gas which flows into a filter 22 when active oxygen emission and the NOx absorbent 61 are used is Lean is absorbed by active oxygen emission and the NOx absorbent 61, and is contained in exhaust gas adheres to active oxygen emission and the NOx absorbent 61 carries out oxidation removal in the inside of a short time. That is, it can be prevented at this time that the particle in exhaust gas and the both sides of NOx are discharged in atmospheric air.
[0099] On the other hand, if the air-fuel ratio of the exhaust gas which flows into a filter 22 becomes rich, NOx will be emitted from active oxygen emission and the NOx absorbent 61. this NOx -- unburnt -- it is returned by HC and CO and NOx is not thus discharged in atmospheric air at this time Moreover, when the particle has accumulated on a filter 22 at this time, in this particle, the active oxygen emitted from active oxygen emission and the NOx absorbent 61 carries out oxidation removal.
[0100] Next, change control of the exhaust gas style for performing reduction of NOx and oxidation of a particle more effectively according to an operation situation is explained according to the flow chart of drawing 11 and drawing 12 .
[0101] The flow chart shown in drawing 11 shows an exhaust gas style change-over control routine, and this exhaust gas style change-over control routine is beforehand memorized by ROM32 of ECU30, and is performed by CPU34 for every fixed time amount.
[0102] If processing starts, CPU34 will judge ****** at the time of moderation including a fuel cut in step 101. The judgment of whether to be at the moderation time whose car includes a fuel cut is judged by G sensor with which the car was equipped, the sensor which detects the amount of treading in of an accelerator pedal, the engine speed sensor (crank angle sensor), a throttle opening sensor, etc.
[0103] When it progresses to step 102 when it judges with it being in step 101 at the moderation time including a fuel cut (step 101: YES), and it judges with on the other hand it not being at the moderation time including a fuel cut (step 101: NO), CPU34 serves as a return and returns to a start location. Exhaust gas temperature will cool a filter low, and since there is a possibility of reducing the oxidization removal capacity of a particle, it is necessary to make the case at the time of moderation including a fuel cut bypass it.
[0104] For this reason, in the following step 102, CPU34 gives an inclination a little to the exhaust air change-over valve 71, makes it a bypass condition, and makes the flow of **** kana gas in casing 23. Then, it will be in the condition that SV fell. If a reducing agent is supplied to a filter in this condition, active oxidation reaction arises, filter temperature rises, and oxidation of a particle can be promoted. Moreover, since the stage when the exhaust gas flow rate which flows in a filter is small and to bypass is aimed at and the reducing-agent provisioning process for NOx emission is performed, NOx can be made to emit in few amount of reducing agents.
[0105] Completion of NOx emission suspends supply of a reducing agent. However, control which CPU34 makes maintain the exhaust air change-over valve 71 so that after reducing-agent supply termination and during the predetermined period t may lead a part of exhaust gas to a filter 22 in step 103 and other exhaust gas flow rates may be passed to the bypass path 73 is performed. In addition, the predetermined period t shall be time amount required to oxidize the reducing agent which remains in a filter 22, and shall be beforehand registered into RAM33. Drawing 13 shows the NOx concentration of the catalyst outlet when being controlled like the above. The exhaust gas passed by the filter for every moderation is bypassed, and by supplying a reducing agent at the time of a parenthesis, it can operate without exceeding an NOx allowed value.
[0106] Since this fuel contains reactant low HC when using a fuel as a reducing agent, much HC remains in the

filter after reducing-agent supply termination. In this condition, after reducing-agent supply termination, when the flow of exhaust gas is immediately switched by the exhaust air change-over valve 71, there is risk of a lot of HC being emitted outside. Then, by this control, in order to prevent HC emission, only the predetermined period t holds the exhaust air change-over valve 71 in the condition as it is, and after reducing-agent supply termination incorporates the exhaust gas of Lean containing oxygen, and promotes oxidation of HC. In addition, with the gestalt of the above-mentioned implementation, although he is trying to supply a reducing agent for every moderation, when the presumed amount of NOx occlusion is small, it is not necessary to necessarily supply a reducing agent.
[0107] After predetermined period t termination, CPU34 ends and (step 104) carries out the return of the reduction processing by NOx emission, and returns to a start location.
[0108] With the flow chart of drawing 11 , it is NOx at the time of moderation operation. NOx which supplies a reducing agent Although the case where reduction control was performed was explained, it is NOx at the time of moderation operation. In operation which fuel cuts, such as the time of high-speed transit, continue, and is not generated in the control which supplies a reducing agent, it is NOx. Reduction controlling becomes impossible. Then, next, when the condition below the set point does not occur [a moderation condition or fuel oil consumption] beyond over predetermined time, it is NOx compulsorily. NOx which supplies a reducing agent Reduction control is explained based on the flow chart of drawing 12 .
[0109] The flow chart shown in drawing 12 also shows an exhaust gas style change-over control routine, and is beforehand memorized by ROM32 of ECU30, and it performs by CPU34 for every fixed time amount.
[0110] If processing starts, CPU34 will judge an NOx allowed value in step 201. The judgment approach of an NOx allowed value is as above-mentioned.
[0111] Drawing 14 shows the appearance NOx concentration of an NOx sensor with the passage of time at the time of high-speed transit. With the gestalt of this operation, as shown in drawing 14 , the NOx allowed value L shall be decided beforehand, it shall register with RAM33, and CPU34 shall judge an NOx allowed value on the basis of this NOx allowed value L.
[0112] In step 201, when it judges with appearance NOx concentration being higher than an allowed value L (step 201: YES), processing progresses to step 202, and CPU34 serves as a return, when it judges with appearance NOx concentration being lower than an allowed value L on the other hand (step 201: NO).
[0113] Next, in step 202, like step 102, CPU34 gives an inclination a little to the exhaust air change-over valve 71, makes it a bypass condition, and makes the flow of **** kana gas in casing 23. If a reducing agent is supplied to a filter in this condition, active oxidation reaction arises, filter temperature rises, and oxidation of a particle can be promoted. Moreover, since the stage when the exhaust gas flow rate which flows in a filter is small and to bypass is aimed at and the reducing-agent provisioning process for NOx emission is performed, NOx can be made to emit in few amount of reducing agents.
[0114] Completion of NOx emission suspends supply of a reducing agent. However, in step 203, CPU34 leads a part of after [reducing-agent supply termination] predetermined time t, and exhaust gas to a filter 22, and performs control which maintains the exhaust air change-over valve 71 so that other exhaust gas flow rates may be passed to the bypass path 73. By this control, most exhaust gas can oxidize the reducing agent by which the filter was adsorbed by making it bypass for the time being.
[0115] After predetermined time t termination, CPU34 ends and (step 204) carries out the return of the reduction processing by NOx emission, and returns to a start location.
[0116] In addition, in invention concerning this application, the time of it being expected that the amount of particle oxidation removal of a filter becomes small may be constituted [******], when fuel oil consumption besides at the time of above-mentioned moderation is smallness.
[0117] Moreover, in the gestalt of the above-mentioned implementation, although the case where one filter was prepared in an exhaust emission control device was explained, this invention includes the case where two or more filters are prepared in an exhaust emission control device.
[0118] For example, the case where drawing 15 adjoined the exhaust emission control device, and equips it with two filters 22a and 22b as a gestalt of another operation is shown, drawing 15 (a) is the top view of an exhaust emission control device, and drawing 15 (b) is the side elevation of an exhaust emission control device.
[0119] As shown in drawing 15 , fuel addition nozzle 80a is prepared between filter 22a and 22b. Thus, when preparing fuel addition nozzle 80a between filter 22a and 22b and supplying a reducing agent, reducing

atmosphere is formed between filter 22a and 22b. Therefore, it is not necessary to lean the exhaust air change-over valve 71 like the gestalt of the above-mentioned operation that a filter should be made reducing atmosphere, and if the exhaust air change-over valve 71 is completely controlled to the mid-position, control of the exhaust air change-over valve 71 will become easy by that of **. In addition, in drawing 15 , since the thing of the same sign as the sign of drawing 3 has the same function, the explanation is omitted.

[0120] Moreover, drawing 16 shows the case where it was in-series to the exhaust emission control device, and it is equipped with Filters 22c and 22d two pieces, drawing 16 (a) is the top view of an exhaust emission control device, and drawing 16 (b) is the side elevation of an exhaust emission control device.

[0121] In the case of this another gestalt of operation, as shown in drawing 16 , filter 22c is prepared in a 1st flueway side, and filter 22d is prepared in the 2nd flueway side. Fuel addition nozzle 80b is prepared on the flueway of the Filters [22c and 22d] mid-position. Thus, also when preparing fuel addition nozzle 80b in filter 22c and 22d and supplying a reducing agent, reducing atmosphere is formed in filter 22c and 22d. Therefore, if the exhaust air change-over valve 71 is controlled to the mid-position, control of the exhaust air change-over valve 71 will become easy by that of **. In addition, in drawing 16 , since the thing of the same sign as the sign of drawing 3 has the same function, the explanation is omitted.

[0122] Moreover, this invention is materialized also when a precious metal catalyst like Platinum Pt and an NOx absorbent are ****(ed) on the layer of the support formed in the filter 22. However, the continuous line which shows the oxidation removable amount G of particles moves to right-hand side a little in this case compared with the continuous line shown in drawing 9 . In this case, active oxygen is emitted from NO2 or SO3 which are held on the front face of Platinum Pt.

[0123] Moreover, the catalyst which may emit active oxygen from NO2 or SO3 which carry out adsorption maintenance, and by which NO2 or SO3 were these-adsorbed as an active oxygen emission agent can also be used.

[0124] Since according to the equipment of this invention it constituted so that it might form by giving an inclination a little to an exhaust air change-over valve for the reducing atmosphere of a filter from the mid-position, and making the flow of **** kana exhaust gas in an exhaust emission control device and a reducing agent might be supplied to a filter in the state of this low SV, NOx can be made to emit in few amount of reducing agents, and NOx reduction can be promoted.

[0125] Moreover, even if it is the case where the flow rate of exhaust gas is not passed to a bypass path like [at the time of high-speed transit] for a long time, it can make NOx emission processing perform compulsorily, since a moderation condition or fuel oil consumption constituted so that said a part of exhaust gas might be compulsorily led to said filter and a reducing agent might be supplied even when the condition below the set point did not occur beyond over predetermined time.

[0126] Furthermore, since the control means was constituted so that a part of said after [reducing-agent supply termination] predetermined period and said exhaust gas might be led to said filter, other exhaust gas flow rates might be passed to said bypass path, and control which maintains said exhaust air means for switching might be performed, it oxidizes the reducing agent (HC) which stuck to the filter with the exhaust gas of Lean containing oxygen and it can be emitted, it can prevent emission of HC.

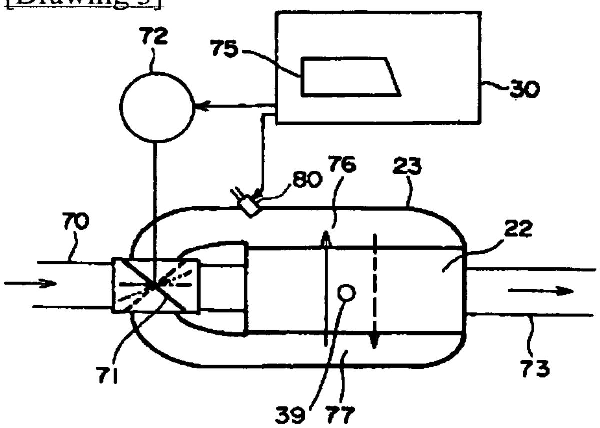
[0127]

[Effect of the Invention] According to this invention as mentioned above, it is NOx. Oxidation of reduction and a particle can be more effectively performed according to an operation situation, and it is NOx. An internal combustion engine's exhaust emission control device which is not emitted outside after reduction termination while reducing agents, such as a fuel, have been unsettled can be offered.

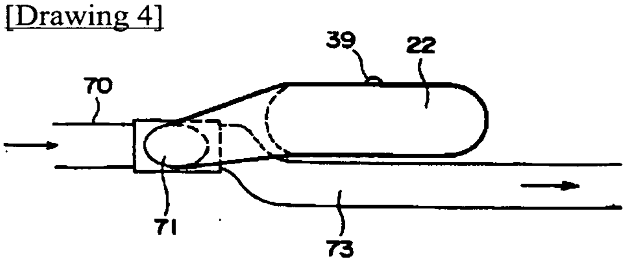
[Translation done.]

DRAWINGS

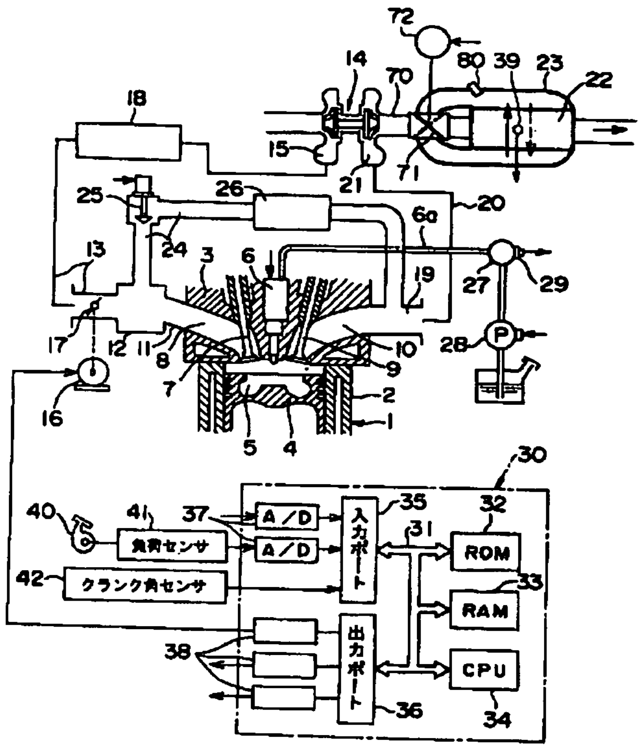
[Drawing 3]



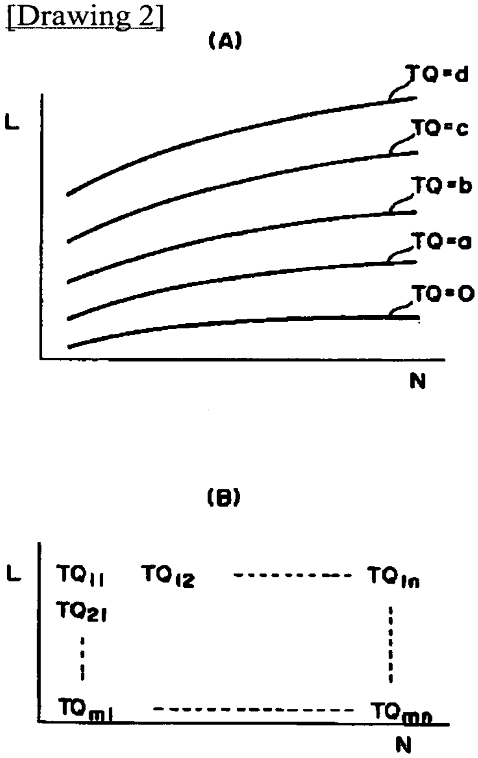
[Drawing 4]



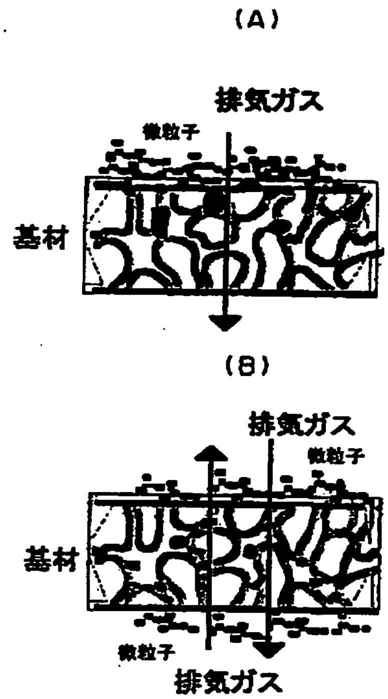
[Drawing 1]



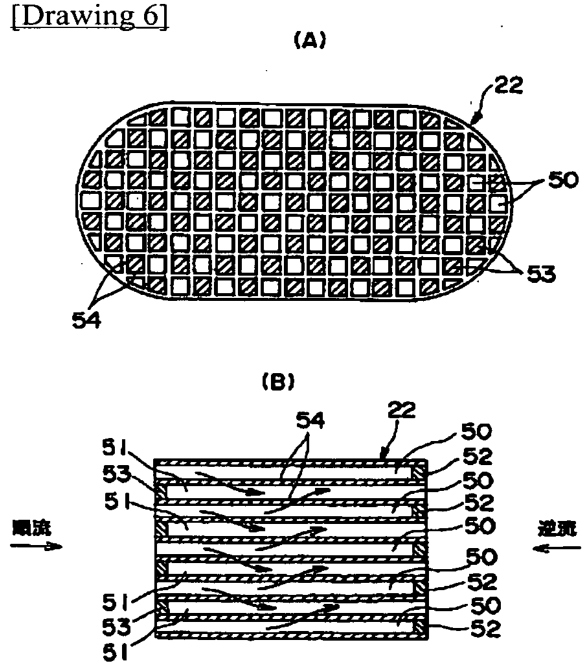
[Drawing 2]



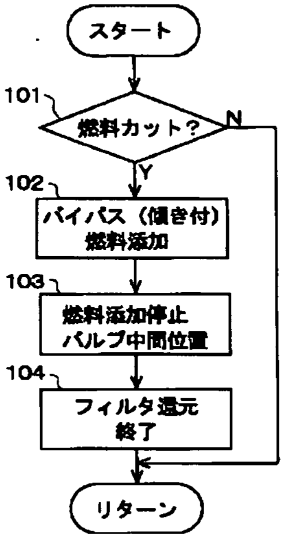
[Drawing 5]



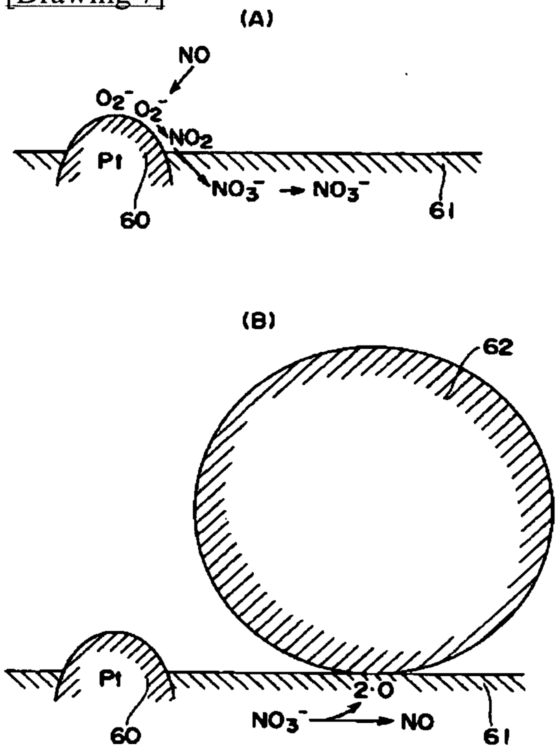
[Drawing 6]



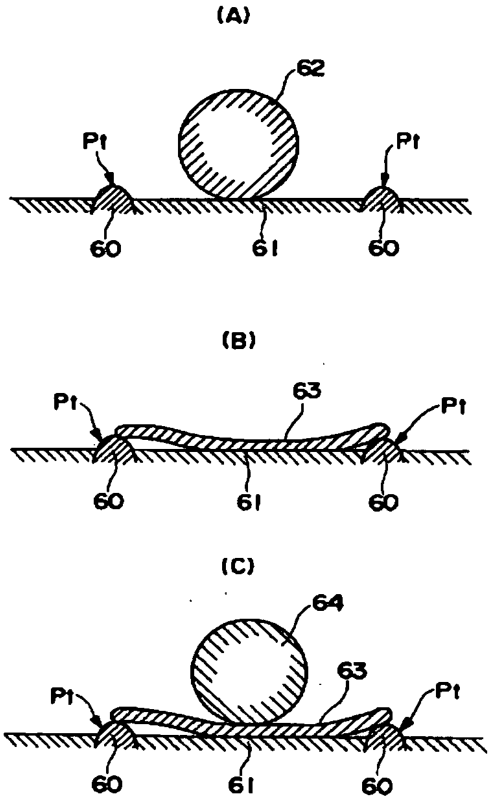
[Drawing 11]



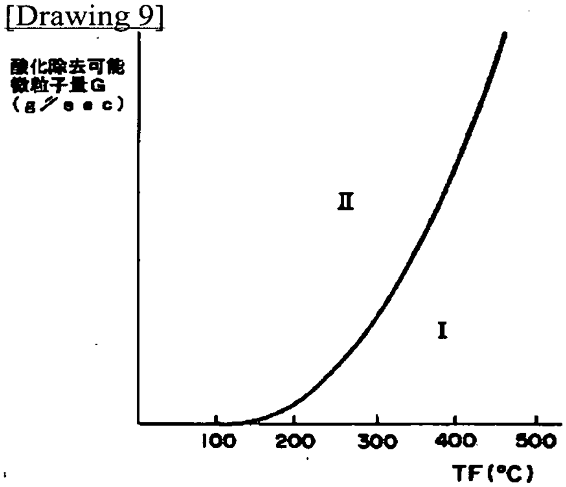
[Drawing 7]



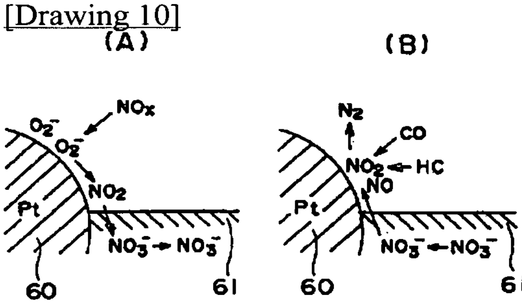
[Drawing 8]



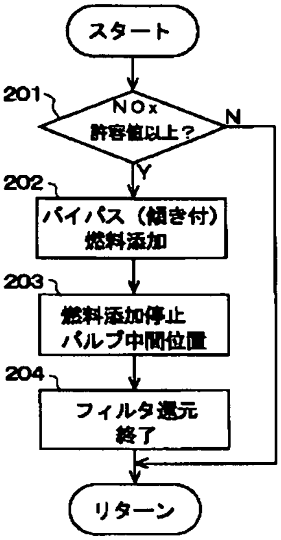
[Drawing 9]



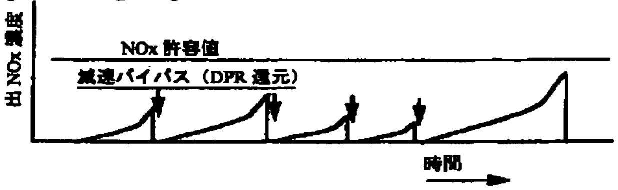
[Drawing 10]



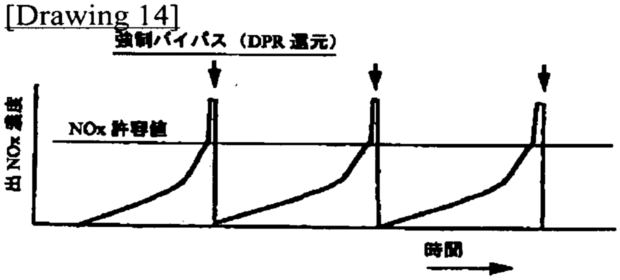
[Drawing 12]



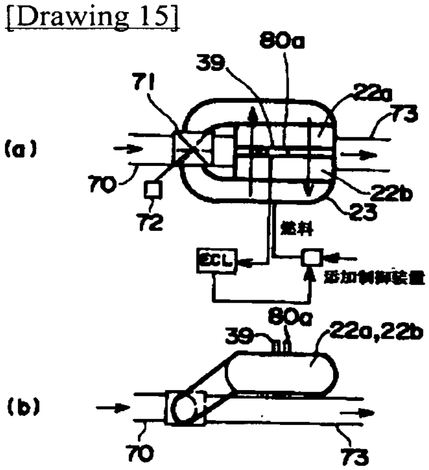
[Drawing 13]



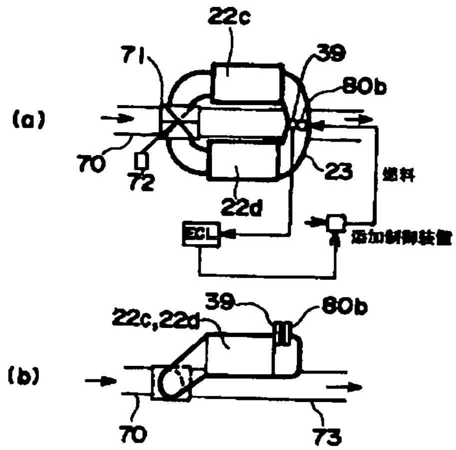
[Drawing 14]



[Drawing 15]



[Drawing 16]



[Translation done.]